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TECHNICAL MANUAL

OPERATION, MAINTENANCE, AND
REPAIR
INSTRUCTIONS

COLD FOOD COUNTERS MODEL C, CLASS 2, STLYE A MODELS ECP-3-1368RC, ECP-4-1368RC, ECP-5-1368RC, AND ECP-6-1368RC

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SAFETY SUMMARY

GENERAL SAFETY NOTICES The following general safety notices supplement the specific warnings and cautions appearing elsewhere in this manual. They are recommended precautions that must be understood and applied during operation and maintenance of the equipment covered herein. Should situations arise that are not covered in the general or specific safety precautions, the commanding officer or other authority will issue orders as deemed necessary to cover the situation.

DO NOT REPAIR OR ADJUST ALONE Under no circumstances should repair or adjustment of energized equipment be attempted alone. The immediate presence of someone capable of rendering aid is required. Before making adjustments, be sure to protect against grounding. If possible, adjustments should be made with one hand, with the other hand free and clear of equipment. Even when power has been removed from equipment circuits, dangerous potentials may still exist due to retention of charges by capacitors. Circuits must be grounded and all capacitors discharged prior to attempting repairs.

TEST EQUIPMENT Make certain test equipment is in good condition. If a test meter must be held, ground the case of the meter before starting measurement do not touch live equipment or personnel working on live equipment while holding a test meter. Some types of measuring devices should not be grounded; these devices should not be held when taking measurements.

INTERLOCKS Interlocks are provided for safety of personnel and equipment and should be used only for the purpose intended. They should not be battle shorted or otherwise modified except by authorized maintenance personnel Do not depend solely upon interlocks for protection. Whenever possible, disconnect power at power distribution source.

WARNING

Disconnect power from unit before doing any maintenance work. The voltage used can be dangerous to life. (Page 4-2, 4-3) (Page 9999-8)

WARNING

Disconnect electrical power from unit before doing any maintenance work. The voltage used can be dangerous to life. (Page 4-2)

WARNING

Disconnect power from unit before doing any maintenance work. The voltage used can be dangerous to life. (Page 4-3, page 4-3)

CAUTION

Do not scrape ice or frost off the blower coil, as this will cause damage to the coil (Page 1-5) (Page 9999-8)

CAUTION

Do not scrape ice or frost off the blower coil, as this will cause damage to the coil. (Page 1-5)

SAFETY PRECAUTIONS

A. In testing for leaks in tubing circuits, use carbon dioxide or nitrogen. Never use oxygen. It may cause an explosion.

B. Silver brazing materials sometimes contain cadmium. Fumes from cadmium are very poisonous. Be sure that the work space is well ventilated. If at all possible, use silver brazing alloys which DO NOT contain cadmium.

C. It is recommended that refrigerant cylinders never be filled above 85 percent of their capacity. If over-filled, the hydrostatic pressure may cause them to burst.

D. Wrenches used on refrigeration line fittings should always fit the nuts well. Poorly fitting wrenches will ruin nuts and bolt heads.

E. Always ″crack″ service valves and cylinder valves before opening. This gives positive control of the flow of gases.

F. Tubing should be bent in as large a radius as possible

G. Moisture is always a hazard to the refrigerating mechanisms. Keep everything connected with refrigerating mechanisms thoroughly dry.

H. Emery cloth should not be used to clean tubing preparatory to soldering. It may leave an oily deposit on the tubing. The grit is hard and would cause considerable damage if it enters the system.

WARNINGS AND CAUTIONS Specific warnings and cautions pertaining to the equipment covered by this manual are summarized below. These warnings and cautions are repeated throughout this manual following paragraph headings and immediately preceding the text to which they apply.

WARNING

Disconnect power from unit before doing any maintenance work. The voltage used can be dangerous to life. (Page 4-2, 4-3)

CAUTION

Do not scrape ice or frost off the blower coil, as this will cause damage to the coil (Page 1-5)

CHAPTER 1

GENERAL INFORMATION

SECTION 1.
GENERAL DESCRIPTION

1-1. INTRODUCTION.

The cold food counters (figure 1-1) are designed and constructed in accordance with Military Specification MIL-C-43300F and all other applicable specifications. To obtain maximum use and satisfaction from their many outstanding features, the cold food counters must be operated properly. It takes just a few minutes to read this technical manual, time well spent to obtain good performance from the cold food counter with a minimum of difficulty.

The proper voltage requirement is: 115 Volt - 60hz - 1 Ph.

The overall dimensions are:

Model:	**ECP-3-1368RC**	**ECP-4-1368RC**	**ECP-5-1368RC**	**ECP-6-1368RC**
Width:	45 inches	66 inches	70 - 1/4 inches	82 - 1/2 inches
Depth:	25 - 1/2 inches	25 - 1/2 inches	25 - 1/2 inches	25 - 1/2 inches
Height:	35 - 3/4 inches	35 - 3/4 inches	35 - 3/4 inches	35 - 3/4 inches

1-2. STORAGE DATA.

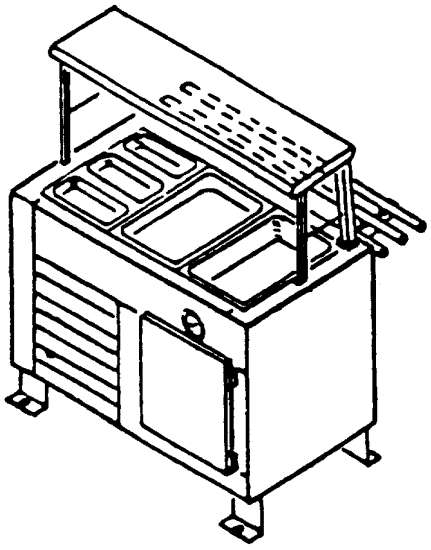
Unit to be stored in a dry controlled atmosphere.

1-3. WARRANTY INFORMATION.

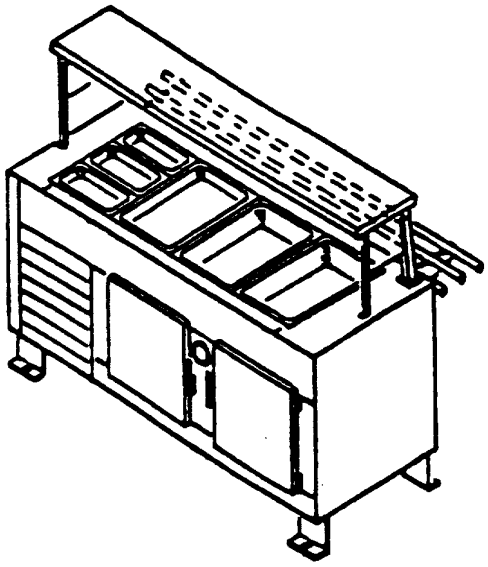
The units are guaranteed for one year from date of acceptance.

1-4. TOOLS/TEST EQUIPMENT.

A standard set of refrigeration tools is recommended for maintenance on these units. No special test equipment is required.



ECP-3-1368RC



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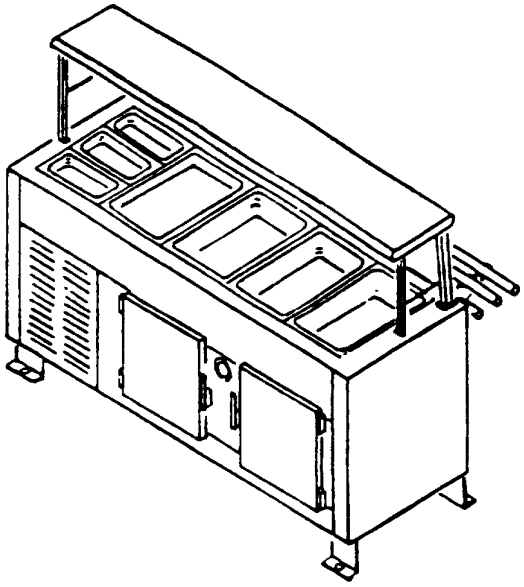
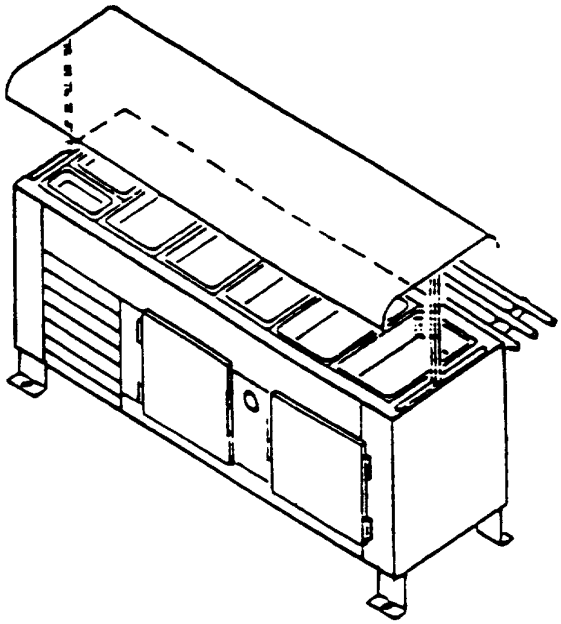


ECP-5-1368RC



ECP-6-1368RC

Figure 1-1. Cold Food Counters

SECTION 2.

DETAILED DESCRIPTION OF ALL COMPONENT PARTS

1-5. EXTERIOR SHELL.

The complete exterior shell is consumed of 18 gauge stainless steel, series 302, 18-8, #4 polished finish. The exterior shell is assembled by means of spotwelding on all flanges with additional supporting seam welding. Before assembly, an odorless sealing compound is inserted between the flanges. When the shell is welded together, this compound is compressed between the flanges to form a vapor proof seal. The only removable panel on the exterior shell are the front and rear louver. These louvers are fastened by machine screws in the corners and are made removable for the purpose of possible repair work within the machinery compartment.

1-6. INTERIOR LINING.

The interior is constructed of 20 gauge stainless steel material and is assembled in the same manner as the exterior. To further insure a good vapor proof seal and also close all dirt crevices, all seams horizontal and vertical of the interior liner are bonded after assembly. All horizontal and vertical corners of the inner liner are coved with a 1/2-inch radius to enable easy cleaning.

1-7. INTEGRAL FRAME.

The integral frame is constructed of galvanized steel angles. The angles are all welded together and welded in strategic spots to the exterior shell. The integral frame acts as a supporting structure only.

1-8. INSULATION.

The insulation used in the cold food counter is a high density fiberglass that is not combustible nor will it support combustion or release toxic fumes when exposed to high temperatures.

1-9. BREAKER STRIP.

The breaker strips are of 1/8-inch thick odorless panelyte. The breaker strips are installed with self threading stainless steel screws with machine type screw threads. A coating of odorless asphalt mastic is applied to the shell flanges before the breaker strips are installed. The breaker strips are removable.

1-10. DOOR.

The door is fabricated of the same material as the cabinet. The doors have an internal welded frame with hinge and latch tapping plates welded thereto. The hardware is attached to the door by machine screws which are inserted in machine tapped holes through the shell and frame.

1-11. HINGES.

The door is equipped with positive acting, spring loaded, self-closing hinges.

1-12. GASKET.

The door is sealed by a magnetic frame rubber door gasket installed to provide a close fitting type seal. The gasket is replaceable and can be removed by removing the screws which hold it in place. The gasket is of the odorless type and can be cleaned with soap and water only.

1-13. SHELVES.

Removable and interchangeable shelves constructed of zinc plated steel wire are provided. They are adjustable on 1/2-inch centers and are held on adjustable brackets. The brackets are of the snap-in type. The pilasters are screwed directly into the interior shell.

1-14. DIAL THERMOMETER.

A 2-inch diameter dial thermometer is provided on the front of the counter to indicate temperature within the refrigerated compartment. Adjustment of this thermometer can be easily accomplished by removing the front cover and setting the dial to the correct temperature with a small screwdriver.

1-15. DEHYDRATOR.

The dehydrator is a cylindrical vessel located in the machinery compartment. The body of the dehydrator contains silica-gel material which removed moisture from the refrigerant by absorption. A filter in the inlet end of the dehydrator prevents silica-gel and other material from entering other parts of the refrigeration system. If the dehydrator is removed for any purpose, it should never be replaced with a unit smaller that the original.

1-16. LIQUID/MOISTURE INDICATOR.

The liquid/moisture indicator assembly located in the machinery compartment consists of a flare filling containing a sigh glass, a cover gasket, and a protective cover. The indicator is used to observe liquid refrigerant as it flows through the system. If the unit contains sufficient refrigerant and is operating normally, the glass will appear clear. If insufficient refrigerant is present bubbles will shown in the glass. If the moisture indicator shows ″pink″, the dehydrator should be changed. For a safe moisture level, the color is ″blue.″

1-17. EVAPORATOR-REFRIGERATED COMPARTMENT.

1-17.1 The evaporator is of the forced circulation type. The evaporator is constructed of 3/8 O. D. seamless copper tubing formed in a continuous serpentine coil. Conduction fins are mechanically bonded to the coil and are spaced on 1/4-inch centers over the complete surface of the coil. After fabrication, the coil and the fins are electro-tin plated.

1-17.2 The coil is installed so that the finned surface is facing the rear of the cold food counter. A louvered housing is fastened over the front surface of the coil. The coil is installed in this manner so that the suction fan is constantly puffing the warmer air over the coil and re-circulating the air in an undisturbed cycle. An important point to remember with an evaporator of this type is not to pack foods too close to the blower coil as this will block the air cycle.

1-17.3 The fan motor, 1/20 h.p., 115 v., is attached to the aluminum hub with machine screws and the hub is attached to the exterior casing. For removal or replacement of either the fan or motor, it is only necessary to remove louvered shield and then remove the machine screws holding the motor in place.

1-17.4 The complete evaporator is attached to the ceiling with hexagon head bolts, washers, and nuts. Three bolts are welded to the overhead structural bracket. There are a total of three 1/4-inch bolts holding the blower coil.

1-17.5 The exterior bottom of the evaporator acts as a drip pan with a 1/2-inch O.D. drain line extending from it. Underneath this drain line is a stainless steel drain pan piped to the exterior of the cold food counter.

CAUTION

Do not scrape ice or frost off the blower coil, as this will cause damage to the coil.

1-17.6 While the cold food counter is operating, the blower coil should never be shut off. The evaporator will defrost automatically on the OFF cycle of the condensing unit.

1-18. EVAPORATOR-COLD FOOD PAN.

1-18.1 The complete evaporator-cold food pan acts as the evaporator. Copper tubing 3/8-inch O.D. is spotwelded to the bottom of the pan in a complete serpentine coil as shown in figure 1-2. The copper tubing is further supported to the pan by means of die-stamped stainless steel straps. These straps are formed to fit over the tubing and are spotwelded to the pan. The evaporator is not replaceable and can only be repaired by removal of the entire cold food pan.

1-18.2 All connections of incoming refrigerant lines are of the swage type silver soldered connections. The complete evaporator is leak and pressure tested before being installed in the cold food counter.

1-19. EXPANSION VALVES.

1-19.1 The cold food counters are supplied with two (2) expansion valves. One expansion valve for controlling the cold food pan is located within the machinery compartment. Another expansion valve for controlling the temperature within the refrigerated compartment is located behind the evaporator housing within the refrigerated compartment.

1-19.2 The expansion valve is designed to meter the refrigerant into the evaporator at a flow rate determined by the product load within the refrigerated space.

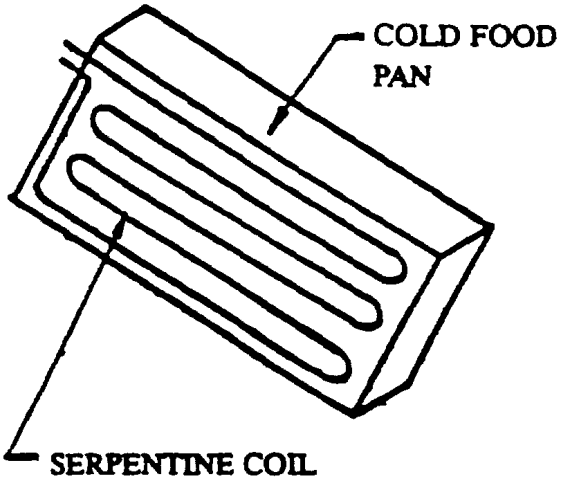


Figure 1-2. Evaporator Cold Food Pan

1-20. PRESSURE CONTROL.

1-20.1 The cold food counters are provided with a dual pressure control to protect the refrigeration system from excessive pressures. The high pressure side will stop the compressor in the event the refrigerated head pressure exceeds the control setting. The high pressure side is also provided with a manual reset button. Should this control open due to a high pressure condition, it must be manually reset. If the unit continues to trip this control, the complete refrigeration system must be examined for any defects.

1-20.2 During normal operation, the low pressure side will de-energize the compressor when the pressure is reduced to approximately 0 psig. Unlike the high pressure control the low pressure control will automatically reset and start the compressor.

1-21. TEMPERATURE CONTROL.

1-21.1 The automatic operation of the refrigeration machinery is controlled by means of a temperature control (figure 1-3) located on the inside of the refrigerated compartment on the evaporator housing. The temperature control is fitted with a two foot long capillary which is mounted in the cabinet to sense the temperature. The capillary line contains a liquid charge that expands and contracts as the temperature in the cabinet goes up or down. This expansion or contraction turns the switch ″ON″ or ″OFF.″

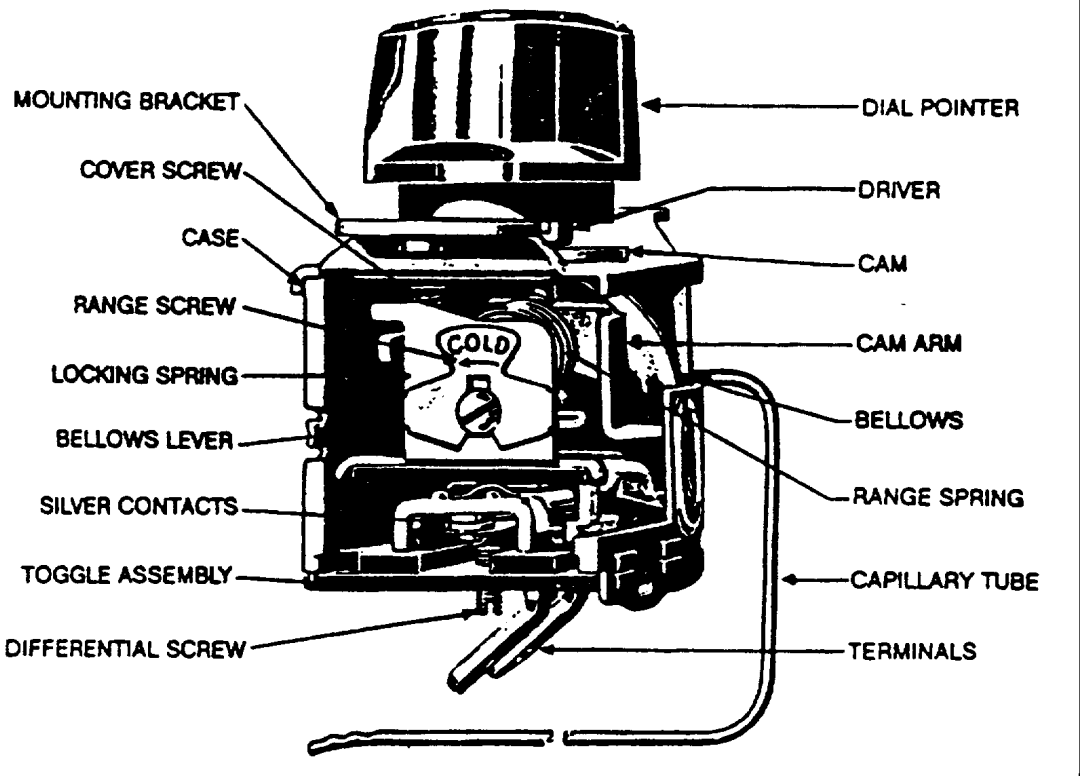


Figure 1-3. Temperature Control

1-21.2 The temperature control is a S.P.S.T. snap acting toggle switch that automatically cycles to CLOSE the circuit on rise, and OPEN the circuit on drop in temperature. The control has a dial knob adjustment for any slight variation in compartment temperature that may be required. The dial is factory set to provide a compartment temperature of 40°F. To lower the temperature, turn the knob clockwise to a lower setting. At no time, except for servicing or replacement purposes, should the knob be removed. The Refrigerator, Evaporator is designed for automatic off cycle defrosting. In the extreme counter-clockwise position the unit will be turned OFF completely.

1-21.3 The temperature at which the switch opens and closes the circuit is adjustable within the limits of the operating range of the temperature control. A differential adjusting screw is also provided on the control to vary the point at which the circuit opens. This adjustment is quite critical and is factory set. DO NOT adjust more than 3/8 turn in either direction. A clockwise rotation of the differential screw will decrease the differential 3°; whereas a counterclockwise rotation will increase the differential 3° at the maximum. The range adjustment always sets the point at which the circuit opens and is governed by the differential adjustment.

1-21.4 A change in the setting of the range adjustment raises or lowers both the opening and closing points, and the differential does not remain constant over the whole operating range, but varies with a change in the range adjustment setting. The range adjustment knob and the differential adjustment screw are both located on the case of the temperature control and do not require it to be opened. Both of these adjustments are factory set when the refrigerator is tested prior to shipment.

1-22. CONDENSING UNIT.

The condensing unit (figure 1-4) is a Model EAAH-0033-1AA, manufactured by Copeland Company. The condensing unit is of the accessible hermetic type. A forced air cooled condenser constructed of finned tubes is

provided for cooling of the refrigerant. The finned condenser in the rear of the unit must be kept clean. If excessive dirt is allowed to accumulate on the condenser, the condenser will not receive proper air circulation. It is important that the condenser be cleaned a least once every 60 to 90 days. It is advisable to shut off power to the unit when cleaning the condenser. The condensing unit also contains a relay and motor protector which are described on the following page.

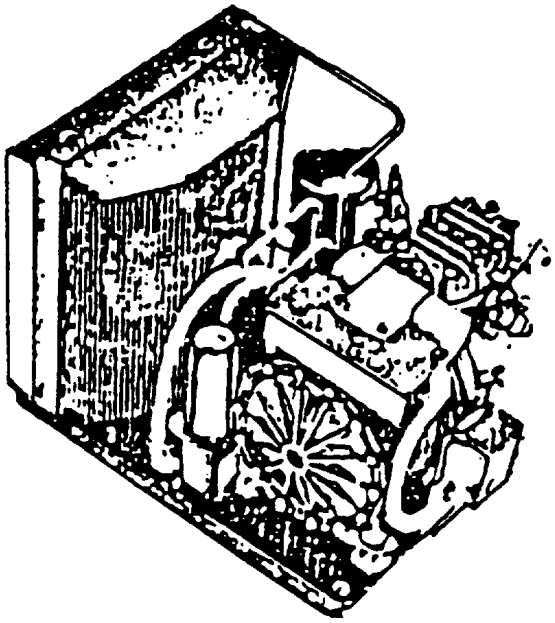


Figure 1-4. Condensing Unit

Table 1-1. Reference Data (ECP-3 and ECP-6)

Compressor Data	Oil
Bore x Stroke - 1 3/32 x 5/8-inches	Type - Suniso #3G
Displacement - 63.4 cu. ft./hr.	Charge - 20 oz.
Speed - 1750 RPM	
BTU's Hour - 920	
	Connection
	Suction - 1/2-inch SAE
Motor Data	Liquid - 1/4-inch SAE
Nominal H.P. - 1/3	Gage - 1/4-inch SAE
Type - Capacitor Start	
Volts - 115	Dimensions
Cycles - 60	Length - 19-1/2-inches
Compressor R.L.A. - 5.0	Width - 14-1/2-inches
Compressor L.R.A. - 31.0	Height - 11-7/16-inches
Fan Motor Amps - 0.6	Weight - 96 lbs
Refrigerant	
R-12	

Table 1-2. Reference Data (ECP-4 and ECP-5)

Compressor Data	Oil
Bore x Stroke - 3/32 x 5/8-inches	Type - Suniso #3G
Displacement - 63.4 cu. ft./hr.	Charge - 20 oz.
Speed - 1750 RPM	
BTU's Hour - 2770	Connections
	Suction - 1/2-inch SAE
Motor Data	Liquid - 3/8-inch SAE
Nominal H.P. - 1/3	Gage - 1/4-inch SAE
Type - Capacitor Start	
Volts - 115	Dimensions
Cycles - 60	Length - 19-1/2-inches
Compressor R.L.A. - 5.4	Width - 14-1/2-inches
Compressor L.R.A. - 31.0	Height - 11-7/16-inches
Fan Motor Amps - 0.6	Weight - 96 lbs
Refrigerant	
R-12	

1-23. RELAY.

The relay consists of a magnetic coil which actuates a movable contact and completes the circuit through the starting winding of the motor. When the motor reaches a predetermined speed, the magnetic coil releases the movable contact and disconnects the starting winding from the circuit. The motor running winding, however, remains in the circuit at all times. The relay is mounted on a shell bracket and no adjustments can be made in the field. In case of relay trouble, the complete assembly can be changed by simply removing the mounting screws and disconnecting the leads.

1-24. SPLIT PHASE MOTOR.

The fundamental theory back of the split phase motor is that a starting torque is induced by a starting winding and main winding in the motor being more or less out of phase with each other electrically and as soon as speed of the motor is brought up to a certain point, the starting winding is cut out and the full load is carried by the running winding of the motor.

1-25. MOTOR PROTECTOR.

1-25.1 THERMAL OVERLOAD. This device, together with the starting relay, is mounted on a bracket welded to the compressor shell and protected by a stamped steel housing. The thermal overload consists of a small, round, plastic casing containing a hearter coil and a bi-metal disc. The hearter coil is designed to carry normal starting and operating currents. However, should the current increase an abnormal amount for any reason, the excessive heat from the coil causes the bi-metal disc to snap open, thus breaking the electrical circuit and stopping the motor. In case the motor winding temperature increases for any other than electrical reasons, the disc is also affected by shell temperature, thus again, protecting the motor from excessive temperature. The motor protector is, therefore, in reality, an electrotemperature protector because it protects the motor winding from getting above predetermined and safe temperatures in all cases.

1-25.2 ABNORMAL CONDITION. When the thermal overload trips for any reason, the circuit remains open until the shell temperature cools to the proper point, at which time the bi-metal disc snaps closed, thus again

starting the motor. This process is repeated as long as there is an abnormal load condition on the compressor for any reason, the thermal oveload is not adjustable and if it fails to function properly, it must be replaced with a factory adjusted assembly.

1-25.3 NORMAL CONDITION. When a unit is started originally with a warm cold food counter, the thermal overload may open and close a few times until the cold food counter begins to cool down. This is a normal condition at the time of the start up and should not be interpreted as motor protection trouble.

CHAPTER 2

INSTALLATION

2-1. INSTALLATION INSTRUCTIONS.

2-1.1 Uncrate the cold food counter. Inspect the exterior and interior, including machinery compartment for damage. Be sure that all packing and crating materials have been removed.

2-1.2 It is recommended that before the unit is started for the first time, a competent refrigeration serviceman check the installation for leaks and general operation. The refrigeration system, including all piping, was checked and tested at the factory for leaks before shipment. It is possible, however, that during shipment some connections might have loosened or some adjustment may be necessary.

2-1.3 The cold food counter is ready for operation once it is connected to a source of electrical power. The service valves on the condensing units are open and in the proper operating positions. The controls are factory set to maintain a temperature of 40°F. ± 3°F. in both the evaporator pan and the refrigerated compartment. No adjustment should be made unless this temperature is not being maintained.

2-1.4 It will take approximately one (1) hour after the cold food counter is turned on before the operating temperature of 40°F. will be reached. Before loading the food pans into the unit, add the desired amount of water to the evaporator pan and allow to chill.

2-1.5 Do not attempt to chill much food in the refrigerated compartment at one time. Loading up the refrigerated compartment with an excessive amount of warm or hot food will only increase the cabinet temperature excessively.

2-2. UNIT RESHIPMENT REQUIREMENTS.

2-2.1 REMOVAL. In the event it becomes necessary to remove the unit and prepare it for shipment back to the factory or to another ship, the above procedure should be followed in reverse.

2-2.2 CRATING. Care should be taken in crating the unit so that it does not move within the shipping crate. Do this by pressure packing between the bottom skid and the top section of the crate.

CHAPTER 3

OPERATING INSTRUCTIONS AND REFRIGERATION CYCLE.

SECTION I

FUNCTIONAL DESCRIPTION

3-1. REFRIGERATION CYCLE.

3-1.1 CIRCULATION. The maintenance of a constant and correct temperature in a refrigerated compartment is dependent upon the intermittent circulation and evaporation of a fixed supply of refrigerant in the evaporator. By means of a thermostatic control whose head sensitive element is located on the evaporator the motor compressor pumps the heat laden gas out of the evaporator through the suction line and into the compressor. The low pressure gas is then compressed by the piston and forced out through the discharge valve into the condenser.

3-1.2 HIGH AND LOW PRESSURE SIDES. The part of the system from the expansion valve exit to the discharge valve in the compressor is called the low pressure side. That part of the system extending from the discharge valve through the condenser and up to the expansion valve is called the high pressure side.

3-1.2.1 High Pressure. As high pressure vapor leaves the compressor and enters the condenser, the higher temperature vapor loses its heat to the air by means of radiating fins which form a part of the condenser. The result is that the high pressure vapor is converted into liquid refrigerant. The liquid refrigerant then passes through a metering device and into the evaporator.

3-1.2.2 Low Pressure. As the liquid refrigerant in the evaporator is subject to a much lower pressure due to the suction of the compressor, it follows that evaporation of the liquid refrigerant will take place at a reduced pressure and temperature with the result that heat is absorbed from the refrigerated compartment. As the pressure and temperature in the evaporator are being lowered by the compressor, a point is reached where the refrigerated chamber has lost sufficient heat to lower the temperature to a point where the control will break the motor circuit and stop the compressor.

3-1.3 TEMPERATURE RISE. The lower suction pressure will soon rise due to the sustained boiling point of the refrigerant. When the boiling stops, the refrigerant will not absorb heat which results in the rise of the refrigerated chamber temperature. Finally, the point is reached where the thermostatic control in the refrigerated space causes the motor to cut in, starting the compressor and beginning the refrigeration cycle over again. A refrigeration diagram is shown in figure 3-1 and wiring diagrams are shown in figure 3-2 and figure 3-3.

3-1.4 NORMAL PRESSURE. Normal refrigerant pressure for the freezer discharge is approximately 130 lbs. When the ambient temperature is at 90°F, suction pressure for refrigerator is approximately 19 lbs. (35°F.).

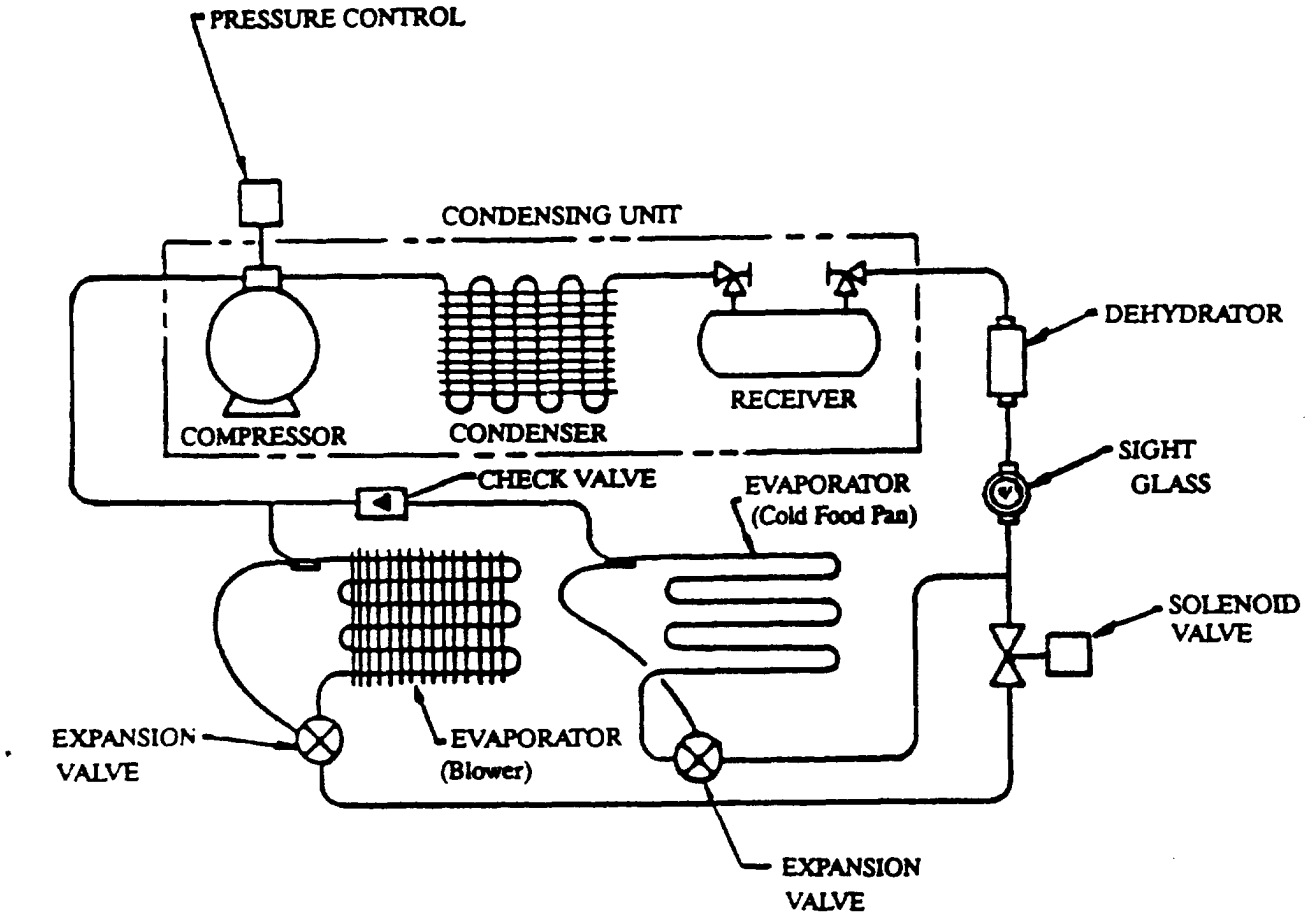


Figure 3-1. Refrigeration Schematic Diagram (Typical)

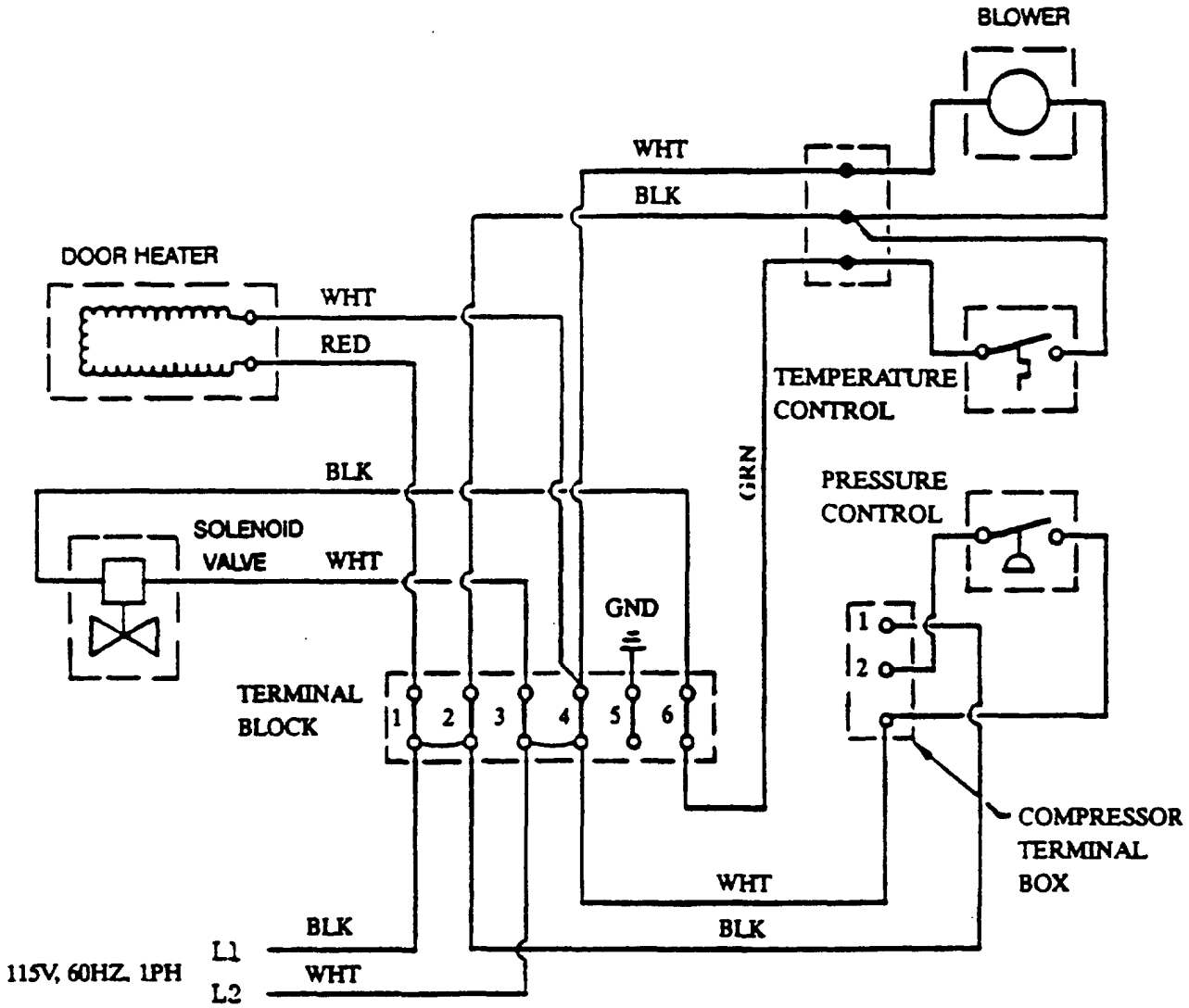


Figure 3-2. Wiring Diagram (Typical ECP-3 and ECP-6)

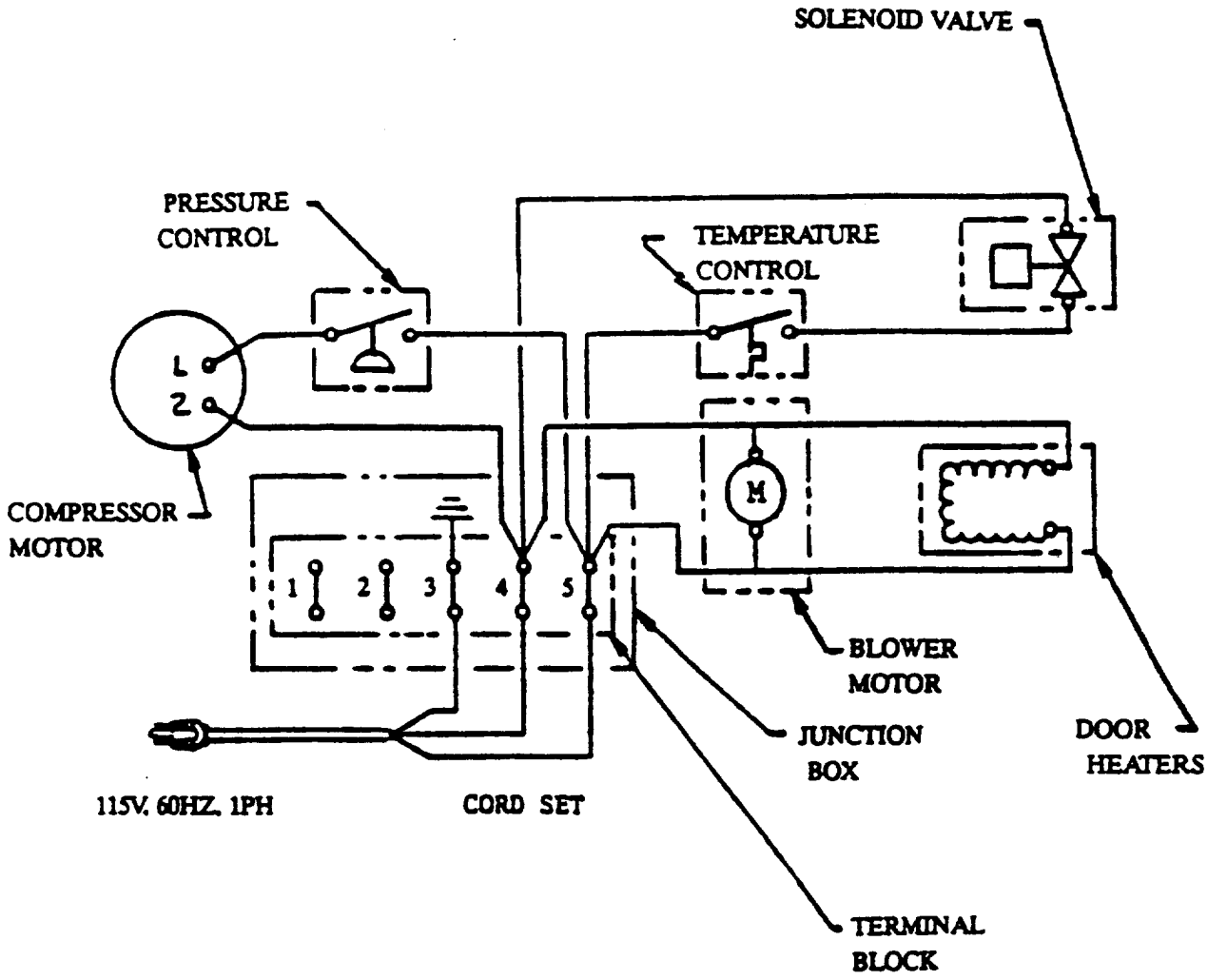


Figure 3-3. Wiring Diagram (Typical ECP-4 and ECP-5)

CHAPTER 4

MAINTENANCE AND REPAIR

4-1. SAFETY PRECAUTIONS.

a. In testing for leaks in tubing circuits, use carbon dioxide or nitrogen. Never use oxygen. It may cause an explosion.

b. Silver brazing materials sometimes contain cadmium. Fumes from cadmium are very poisonous. Be sure that the work space is well ventilated. If at all possible, use silver brazing alloys which DO NOT contain cadmium.

c. It is recommended that refrigerant cylinders never be filled above 85 percent of their capacity. If overfilled, the hydrostatic pressure may cause them to burst.

d. Wrenches used on refrigeration line fittings should always fit the nuts well. Poorly fitting wrenches will ruin nuts and bolt heads.

e. Always ″crack″ service valves and cylinder valves before opening. This gives positive control of the flow of gases.

f. Tubing should be bent in as large a radius as possible.

g. Moisture is always a hazard to the refrigerating mechanisms. Keep everything connected with refrigerating mechanisms thoroughly dry.

h. Emery cloth should not be used to clean tubing preparatory to soldering. It may leave an oily deposit on the tubing. The grit is hard and would cause considerable damage if it enters the system.

4-2. MAINTENANCE.

No parts of this refrigerator require lubrication. The condensing unit is permanently oiled and sealed. The finned condensing unit must be kept clean. If too much dirt is allowed to accumulate on the condenser, the compressor will not receive proper air circulation. Suction fan constantly pulls air through this condenser, so this operation should be done at least once every sixty days.

4-3. TESTING FOR FREON LEAKS.

In case an undercharge of refrigerant is apparent, the complete system should be tested for leaks. In checking for leaks with a Halide torch lead detector, follow these instructions:

a. Block condenser to increase pressure for testing.

b. Freon released in purging must be thoroughly blown away.

c. Do not have flame too large or small leaks cannot be detected.

d. Keep end of rubber tube clean and free of oil.

e. Pass the pick-up tube very slowly around all sides of the joint or connection being tested.

f. Make certain that the copper reaction plate on the torch has not been burned away.

g. In the presence of freon, the color of the flame on the Halide torch will turn green.

4-4. NORMAL CHARGE.

The correct refrigerant charge is that quantity of refrigerant which will refrigerate all the evaporator coils and, at the same time, will not cause frosting or sweating of the suction line. This is the perfect charge which gives the best performance. Any appreciable variation from this charge will affect the performance. The system refrigerant charge is 1 lb.

4-5. RECHARGING SYSTEM WITH FREON.

The following procedures shall be used when recharging the system with freon:

a. Make certain that all lines and fittings, as well as the freon to be added are absolutely dry and clean. The presence of an infinitesimal amount of moisture will cause a freeze-up in the liquid line.

b. Back seat the suction valve service port.

c. Set freon charging drum upright so that only gas will enter the system, not liquid.

d. Connect charging line from freon drum to suction server valve on compressor.

e. With compressor running, screw suction valve in slowly, adding the charge until frost-line in cabinet is normal and suction line temperature is correct.

4-6. UNIT OVERCHARGED.

The following procedures shall be used to relieve the unit due to overcharging:

a. Back seat liquid line valve.

b. Remove cap from service port.

c. With unit running, crack liquid valve off its back seat for a few seconds, allowing excess liquid charge to purge off.

d. Do not purge too rapidly or too much at a time or you may over-purge, necessitating recharging.

4-7. CONDENSING UNIT REPLACEMENT.

If it has definitely been determined that the hermetic unit, and not the thermal overload, relay or other parts are defective, then remove the old unit as follows:

WARNING

Disconnect electrical power from unit before doing any maintenance work. The voltage used can be dangerous to life.

a. Disconnect unit from power source.

b. Front seat suction and liquid lines on unit.

c. Disconnect refrigerant lines and plug IMMEDIATELY with flare plugs.

d. Front seat liquid and suction lines on new unit and locate unit properly in cabinet.

e. Remove plugs from both capillary and suction and connect immediately to respective service valves.

f. Crack liquid valve on unit and allow freon pressure from unit to purge through capillary into coil and out the loose suction line. Open liquid valve and back seal.

g. Tightly cap suction gauge port. Open (back seat) suction valve; allow unit to run for several minutes and check liquid and suction line connections for leaks.

h. Adjust charge as previously explained.

i. Replace caps securely and test for leaks.

4-8. OPERATING PRESSURES.

Normal operating pressures are approximately 5 to 35 lbs. low side (35° F) and 120 lbs. high side (90° F). If high suction pressure and low head pressures are about equal it indicates that the compressor is not pumping and the unit should be replaced.

4-9. RELAY AND OVERLOAD PROTECTOR REPLACEMENT.

The following procedures shall be used to replace either the compressor relay or overload protector.

WARNING

Disconnect power from unit before doing any maintenance work. The voltage used can be dangerous to life.

a. Disconnect power.

b. Snap off spring steel retaining clip on compressor terminal box and remove plastic cover.

c. Pull off relay or overload from terminals, tag and disconnect each wire.

d. To install new component follow this procedure in reverse.

4-10. PRESSURE CONTROL REPLACEMENT.

The following procedures shall be used to replace the pressure control.

WARNING

Disconnect power from unit before doing any maintenance work. The voltage used can be dangerous to life.

a. Disconnect power.

b. Back seat suction service valve and remove flare nut on pressure control capillary line.

c. Tag and disconnect electrical leads.

d. Remove two mounting screws on rear of control bracket and remove control.

e. To install new control follow this procedure in reverse and front seat suction service one turn.

4-11. EXPANSION VALVE REPLACEMENT.

The following procedures shall be used to replace the expansion valve.

a. Close service valve on liquid (discharge) line and install a pressure gage on the low side (suction) service valve.

b. Run compressor to pump down low side to approximately 1 lb psig, and turn off compressor.

c. Close suction service valve.

d. Remove flare nut on expansion valve capillary line, disconnect feeler bulb and mounting hardware.

e. Install new expansion valve tighten all hardware and connections.

f. With compressor ″off″ loosen flare nut at suction service valve, crack valve (one turn) allowing freon gas to escape for approximately 30 seconds and tighten flare nut immediately.

g. Remove pressure gage and reinstall pressure control connection at suction service valve.

h. Crack open (1 turn) both service valves.

i. Start compressor and allow to operate until evaporator is cold.

j. Add freon, see paragraph 4-5.

4-12. LOCATING TROUBLES.

4-12.1 METHODS. Methods of testing used to locate the sources of trouble are based on the operating principles of the mechanism by checking the pressures, the temperatures, the running time, etc., the serviceman is soon able to isolate or pick out that part of the system which is giving trouble.

4-12.2 TROUBLE IDENTIFICATION. The serviceman should check the following items in the refrigeration machinery before coming to a conclusion as to the trouble.

a. Low side pressure.

b. High side pressure.

c. Temperature of cooling unit.

d. Temperature of liquid and suction lines.

e. Amount of dryness of refrigerant

f. Running time of mechanism.

g. Probability of leaks.

h. Noise.

4-12.3 BASIC TROUBLES. There are several basic fundamentals that help make locating trouble easier. When there is poor refrigeration or no refrigeration either one or both of two things can be wrong.

4-12.3.1 No Refrigerant. If there is very little or no refrigerant, there will be no liquid refrigerant in the evaporating unit. A lack of refrigerant means that the refrigerant has leaked out or it is being held in a certain part of the system by clogged needles, clogged screens, pinched lines, etc. This clogging condition will cause a high vacuum reading on the low side. If there is a lack of refrigerant in the complete system, there will be a hissing sound at the refrigerant control which will indicate the refrigerant passages are not closed. A hissing sound at the refrigerant control always indicates a lack of refrigerant because the dry gas going through the restriction will cause the gas noise.

4-12.3.2 Pump Malfunction. If the pump is not functioning, the low side pressure will be above normal and the condenser and discharge line from the compressor will be below normal temperature. To determine what is responsible for a poor condensing condition, proceed as follows:

a. Install the gage manifold and determine the head pressure.

b. Compare this pressure with what the pressure should be for the refrigerant being used.

c. If liquid line is partially or completely clogged, if there is moisture frozen in the tube or if the screen is clogged, not refrigerant can pass into the evaporator coil. This stoppage of flow will give a high vacuum reading and a normal or high head pressure. If it is a lack of refrigerant, the low and high side pressures will be below normal.

4-13. TROUBLESHOOTING CHART.

The complete troubleshooting chart on pages 4-6 through 4-8 includes specific troubles with causes and remedies.

TROUBLESHOOTING CHART

Symptoms	Cause	Remedy
A. Compressor does not run.	1. Motor line open.	1. Close start or disconnect switch.
	2. Fuse blown.	2. Replace fuse.
	3. Tripped overload.	3. See electrical section.
	4. Control stuck open.	4. Repair or replace.
	5. Piston stuck.	5. Remove motor-compressor head. Look for broken valve and jammed parts.
	6. Frozen compressor or motor bearings.	6. Repair or replace.
	7. Control off account cold location.	7. Use thermostatic control or move control to warmer location.
B. Unit short cycles.	1. Control differential set too closely.	1. Widen differential
	2. Discharge valve leaking.	2. Correct condition.
	3. Motor-compressor overload cutting out.	3. Check for high head pressure, tight bearings, stuck pistons, clogged air or water-cooled condenser or water shut-off.
	4. Shortage of gas.	4. Repair leak and recharge.
	5. Leaky expansion valve	5. Replace.
	6. Refrigerant, overcharger	6. Purge.
	7. Cycling on high pressure cut-out.	7. Check water supply.
C. Compressor will not start-hums intermittently (cycling on overload).	1. Improperly wired. 2. Low line voltage.	1. Check wiring against diagram. 2. Check main line voltage-determine location of voltage drop
	3. Open starting capacitor.	3. Replace starting capacitor.

TROUBLESHOOTING CHART - Continued

Symptoms	Cause	Remedy
	4. Relay contacts not closing	4. Check by operating manually. Replace relay if defective.
	5. Open circuit in starting winding.	5. Check stator leads. If leads okay, replace stator.
	6. Stator winding grounds	6. Check stator leads. If leads okay, replace stator.
	7. High discharge pressure.	7. Eliminate cause of excessive pres. sure. Make sure discharge shut-off valve is open.
	8. Tight compressor.	8. Check oil level-correct binding.
D. Compressor starts, motor will not get off starting winding	1. Low line voltage.	1. Bring up voltage.
	2. Improperly wired.	2. Check wiring against diagram.
	3. Defective relay.	3. Check operation manually - replace relay if defective.
	4. Running capacitor shorted.	4. Check by disconnecting running capacitor.
	5. Starting and running windings shorted.	5. Check resistances. Replace stator if defective
	6. Starting capacitor weak.	6. Check capacitance, replace if low.
	7. High discharge pressure	7. Check discharge shut-off valve. Check pressure.
	8. Tight compressor.	8. Check oil level. Check binding.
E. Relay burn out.	1. Low line voltage	1. Increase voltage to not less than 10% under compressor motor rating.
	2. Excessive line voltage.	2. Reduce voltage to maximum of 10% over motor rating.
	3. Incorrect running capacitor.	3. Replace running capacitor with correct mfd. capacitance.
	4. Short cycle.	4. Reduce number starts per hour.
	5. Incorrect mounting.	5. Mount relay in correct position.
	6. Relay vibrating	6. Mount relay in rigid location.
	7. Incorrect relay.	7. Use relay properly selected for motor characteristics.
F. Starting capacitors burn out.	1. Short cycling.	1. Replace starting capacitor with series arrangement or reduce number of starts per hour to 20 or less.
	2. Prolonged operation on starting winding.	2. Reduce starting lead (install suction regulating valve), increase voltage if low.
	3. Relay contacts sticking.	3. Clean contacts or replace relay.
	4. Improper capacitor.	4. Check Parts Catalog for proper capacitor rating-mfd. and voltage.
G. Running capacitors burn out.	1. Excessive line voltage.	1. Reduce line voltage to not over 10% over rating of motor.
	2. High line voltage and light load.	2. Reduce voltage if over 10% excessive. Check voltage imposed on capacitor and select one equivalent to this in voltage rating.
H. Unit operates long or continuously.	1. Shortage of gas.	1. Repair leak and recharge.
	2. Control contacts frozen.	2. Clean points or replace control.

TROUBLESHOOTING CHART - Continued

Symptoms	Cause	Remedy
	3. Dirty condenser	3. Clean condenser.
	4. Location too warm.	4. Change to cooler location.
	5. Air in system.	5. Purge.
	6. Compressor inefficient.	6. Check valves and pistons.
	7. Plugged expansion valve or retainer.	7. Clean or replace.
	8. Iced or plugged coil.	8. Defrost or clean.
	9. Defective insulation.	9. Correct or replace.
	10. Service load.	10. Keep doors closed
	11. Unit too small.	11. Add unit or replace.
I. Fixture temperature too high.	1. Refrigerant shortage.	1. Repair leak and recharge.
	2. Control set too high.	2. Reset control.
	3. Expansion valve or strainer plugged.	3. Clean or replace.
	4. Compressor inefficient.	4 Check valves and pistons.
	5. Expansion valve set too high.	5. Lower setting.
	6. Iced or dirty coil	6. Defrost or clean.
	7. Cooling coils too small.	7. Add surface or replace.
	8. Unit too small.	8. Add unit or replace.
	9. Expansion valve too small	9. Raise suction pressure with larger valve.
	10. Restricted or small gas lines.	10. Clear restriction or increase line size

CHAPTER 5

Table 5-1. COMPONENT PARTS LIST

Qty	Description	Service Part No.	Manufacturer
ECP-3-1368-RC, ECP-4-1368RC, ECP-5-1368RC, and ECP-6-1368RC)			
1		EAAH-033-1AA	Copeland
1	Evaporator Blower	MJ-90	Peerless
1	Dehydrator	EK-032	Alco
1	Solenoid Valve	100RA 2F2	Alco
1	Check Valve	A-15621	Mueller
2	Expansion Valve	RCD 1/2 FW	Alco
1	Liquid/Moisture Indicator	SG114R	Watsco
1	Pressure Control	P70MA-2	Penn
1	Temperature Control	A30-542	Ranco
1	Dial Thermometer	M300123	MGR
2	Door Hinge, Right	2952-1211-1110	Std. Keil
2	Door Hinge, Left*	2852-1311-1110	Std. Keil
1	Terminal Block	601C-5	Kulka
1	Junction Box	LT 11-33	Perfect-Line
3	Food Pan One-Third Size	M302	Polar Ware
(ECP-3-1368RC)			
2	Wire Shelf	19-1/2 W x 19-3/4 D	MGR
4	Pilasters	60	Kason
8	Shelf Clip	66	Kason
2	3-Rail Tray Bracket	1509-1210-1251	Std. Keil
1	Food Pan, Full Size Shallow	M2000	Polar Ware
1	Door Gasket	SK37-37	MGR
(ECP-3-1368RC and ECP-4-1368RC)			
2	Food Pan, Full Size Deep	M2004	Polar Ware
(ECP-4-1368RC)			
4	Wire Shelf	25.12 x 19.75	MGR
(ECP-5-1368RC)			
4	Wire Shelf	21.5 x 19.75	MGR
(ECP-6-1368RC)			
2	Wire Shelf	25.12 x 19.75	MGR
8	Shelf Clip	66	Kason
3	Food Pan, Full Size Shallow	M2000	Polar Ware
(ECP-4-1368RC, ECP-5-1368RC and ECP-6-1368RC)			
8	Pilasters	60	Kason
3	3-Rail Tray Bracket	1509-1210-1251	Std. Keil
2	Door Gasket	SK137-37	MGR
(ECP-4-1368RC and EPC-5-1368RC			
16	Shelf Clip	66	Kason
2	Food Pan, Full Size Shallow	M2000	Polar Ware
(ECP-5-1368RC and ECP-6-1368RC)			
3	Food Pan Full Size Deep	M2004	Polar Ware
(ECP-3-1368RC, ECP-4-1368RC and ECP-5-1368RC)			

Table 5-1. COMPONENT PARTS LIST - Continued

Qty	Description	Service Part No.	Manufacturer
1	Protector Bracket (Right)	1526-2100-1000	Std. Keil
1	Protector Bracket (Left)	1526-2200-1000	Std. Keil
1	Protector Bracket (Center)*	1526-2300-1000	Std. Keil

*Not used for (ECP-3-1368RC)

Table 5-2. MAINTENANCE PARTS LIST

Qty	Description	Service Part No.	Manufacturer
(ECP-3-1368RC, ECP-4-1368RC, ECP-5-1368RC, and ECP--6-1368RC)			
	Overload Thermal	071-0092-04	Copeland
1	Capacitor, Start	01-0008-58	Copeland
1	Relay, Compressor	040-0001-01	Copeland
1	Dehydrator	EK-032	Alco
1	Solenoid Valve	100RA 2F2	Alco
1	Expansion Valve	RCD 1/2 FW	Alco
1	Pressure Control	P70MA-2	Penn
1	Temperature Control	A30-542	Ranco
1	Door Gasket	SK137-37	MGR
1	Door Hinge, Right	2852-1211-1110	Std. Keil
1	Door Hinge, Left*	2852-1311-1110	Std. Keil
1	Dial Thermometer	M300123	MGR

*Not used for (ECP-3-1368RC)